CHAPTER 6

# Emerging Technologies

www.ilmkidunya.com

**Q. What is meant by emerging technologies? Briefly discuss different emerging technologies.**

**Emerging Technologies**

Emerging technologies are new tools, systems, or methods that are being developed or have recently started to be used. These technologies can change the way we live, work and interact with the world. These technologies can be used in every field of life such as education, information technology, medical, transportation and communication etc.

Different emerging technologies are as follows:

**1. Artificial Intelligence (AI)**

**Artificial Intelligence** refers to the ability of machines or software to learn and perform tasks like human beings. Voice recognition, face recognition and decision making are qualities of human intelligence that can be present in artificial intelligence.

Some real-life examples of Artificial Intelligence are as follows:

- Mobile phone assistants such as **Siri** and **Google Assistant** use AI to understand voice commands, answer questions and perform tasks.
- Self-driving cars use AI to detect objects through cameras and sensors and drive safely without a human driver
- Face recognition systems use AI to identify unique facial features and unlock mobile phones securely.

**2. Cloud computing**

Cloud computing refers to the delivery of computing services such as data storage, software applications and processing power over the Internet. It allows users to access these services without installing them on a local device. Some examples of cloud computing platforms include **Google Drive**, **Dropbox** and **Amazon Web Services (AWS)**.

**3. Blockchain**

**Blockchain** is a digital ledger or database of transactions that is shared and maintained by network users. The information is not stored at a single central location. It is stored across a network of computers around the world. The information is grouped in blocks that are linked together in a chain. Each block in a chain contains information from the previous block. Blockchain uses strong cryptography techniques to ensure that transaction data is safe and very hard to change or hack. Blockchain is the fundamental technology behind digital currencies such as Bitcoin.




**Figure:** Blockchain technology

### 4. Internet of Things (IoT)

The **Internet of Things (IoT)** refers to a system in which every day physical objects are connected to the internet. These objects use sensors and network connectivity to collect, send and receive data. IoT makes life easier, safer and more efficient. Some commonly used IoT-enabled devices include smartphones, smartwatches, home appliances, smart thermostats, smart light bulbs and cars.

Some examples of IoT devices are as follows:

- **Smart Home:** Smart home is a popular application of IoT. The user can control various IoT devices at home from any location. For example, the user can control air conditioning or turn the lights on or off remotely.
- **Smart Thermostat:** Smart thermostat adjusts the room temperature based on weather conditions and user preferences.

### 5. Augmented Reality (AR) and Virtual Reality (VR)

**Augmented Reality (AR)** adds computer-generated elements such as videos, images or sounds to the real-world environment. It can be experienced through devices such as smartphones or specialized AR glasses. **Virtual Reality (VR)** creates a completely virtual environment. The users can explore and interact with VR using special equipment such as VR headsets. Both AR and VR are widely used in gaming, education and training.

### 6. 5G Technology

**5G** is the fifth generation of wireless technology. It provides faster internet speeds and more reliable connections than previous generations like 4G. It improves the performance of mobile phones, smart devices and real-time applications. It also supports the growth of emerging technologies such as augmented reality (AR) and virtual reality (VR) by offering the required high-speed data transfer.

### 7. Quantum Computing

**Quantum computing** is a type of advanced computing that uses tiny building blocks called qubits. A **qubit** can represent both 0 and 1 at the same time which is different from regular bit that can only represent either 0 or 1. This unique ability allows quantum computers to solve certain complex problems much faster than traditional computers.

### 8. Biotechnology

**Biotechnology** is the use of living organisms such as bacteria, plants or cells to develop new products or solve practical problems. It combines biology with technology to improve health, agriculture and the environment.

Some applications of biotechnology are as follows:

- Develop new medicines and vaccines
- Improve crop quality and yield
- Create environmentally friendly materials and solutions

www.ilmkidunya.com

**Q. Discuss some benefits of cloud computing.**

Some benefits of cloud computing are as follows:

**1. Share Information**

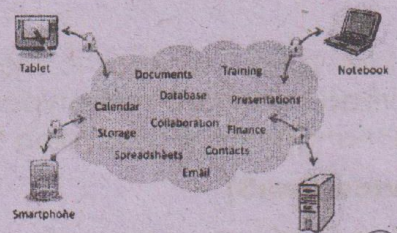
People can easily upload files to the cloud and allow others to access them from anywhere using the internet.

**2. Collaborate on Projects**

Team members can work together on the same document or task in real time from different locations.

**3. Scalability**

Businesses can increase storage or computing power as needed without buying and maintaining expensive hardware.




**Q. Describe basic concepts of cloud computing including virtualization, scalability & elasticity and on-demand access.**

**Basic Concepts of Cloud Computing**

Cloud computing is based on several core concepts that are essential to understand its functionality and benefits. These concepts make cloud services flexible, efficient and cost-effective for the users.

**1. Virtualization**

**Virtualization** is a technology that enables a single physical machine to run multiple virtual machines (VMs). Each virtual machine acts like a separate computer. These virtual machines operate independently and run their own operating system and applications. This increases efficiency and resource utilization. It is a key concept in cloud computing.

**2. Scalability and Elasticity**

Scalability and elasticity are important features that help cloud systems to manage resources efficiently.

**Scalability** refers to the ability to increase computing resources such as servers or storage when demand rises. Suppose the user runs an online store. The number of buyers increase during special events such as Eid. Scalability allows the user to add more servers to handle the increased traffic. It ensures that the website runs smoothly without slowing down or crashing.

**Elasticity** allows cloud systems to automatically adjust computing resources by increasing or decreasing them based on current demand. Suppose the online store receives a sudden increase in traffic during sale. The cloud platform can automatically allocate more servers to handle the load and scale down afterward. It ensures efficient use of resource use and prevents unnecessary costs.

www.ilmkidunya.com

### 3. On-Demand Access

**On-demand access** means the user can use computing resources as needed without waiting for long setup process. This concept is similar to turning on a water tap instead of digging a well.

**Example**

Suppose the user is working on a college project and suddenly needs extra storage to save files. The on-demand access allows the user to quickly rent additional storage from a cloud provider and start using it immediately. This allows the user to focus on the project without worrying about setup or storage issues.

**Q. Describe different types of cloud services with examples.**

**Types of Cloud Services**

Cloud computing provides various services to meet different user needs. These services are typically categorized into three main types. Each type offers a different level of control, flexibility and management according to the user's needs.

### 1. Infrastructure as a Service (IaaS)

**Infrastructure as a Service (IaaS)** provides basic computing resources including virtual servers, data storage and networking hardware. It is delivered on a pay-as-you-go basis that means the users pay only for the resources they use. The users have control over operating systems, applications and storage. The cloud provider manages the underlying physical infrastructure.

**Example**

**Amazon Web Services (AWS)** offers users to rent virtual servers to run applications. Some other popular IaaS providers are **Microsoft Azure** and **Google Compute Engine**.

### 2. Platform as a Service (PaaS)

**Platform as a Service (PaaS)** provides a cloud-based platform for developers to build, deploy and manage applications without managing the underlying hardware and software infrastructure. It is complete development and deployment environment that includes programming languages, databases, web servers and operating systems. PaaS simplifies the development process and speeds up application delivery.

**Example**

**Google App Engine** allows developers to build and deploy applications using various programming languages. Some other examples include **Microsoft Azure App Services** and **Heroku**.

### 3. Software as a Service (SaaS)

**SaaS** allows users to access software applications over the internet. These applications are hosted and managed by the cloud service provider. The users simply subscribe to the service and access the applications online. They do not need to install or manage any hardware or software on their own devices.

**Example**

**Google Workspace** (formerly G Suite) includes widely used applications such as **Gmail**, **Google Docs** and **Google Drive**. Some other common SaaS platforms include **Microsoft Office 365** and **Salesforce**.

www.ilmkidunya.com

**Q. What is Salesforce and how does it support businesses as SaaS platform?**

**Salesforce**

**Salesforce** is one of the most widely used **Software as a Service (SaaS)** platforms. It is primarily known for its powerful **Customer Relationship Management (CRM)** software. It allows businesses to manage customer information, monitor sales activities, and automate marketing. Salesforce is used by over 150,000 companies worldwide to improve operational efficiency and customer satisfaction.

**Q. What is the purpose of cloud deployment model? Discuss different types of cloud deployment models with examples.**

**Cloud Deployment Models**

**Cloud deployment models** define how cloud services are made available, delivered and managed for users or organizations. Each model offers a different level of control, security and flexibility. The selection of a deployment model depends on the specific needs and goals of the organization or users.

The four main cloud deployment models are as follows:

**1. Public Cloud**

A **public cloud** is a cloud service offered over the internet that is shared among multiple organizations or users. The resources are owned and managed by a cloud service provider. The public cloud is cost-effective as users only pay for the resources they use. They generally offer lower security because it is a shared environment.

**Example**

**Amazon Web Services (AWS)** is a widely used public cloud provider. It provides various computing resources such as virtual servers and data storage. It can be used by the organizations of all sizes. without managing the underlying hardware.

**2. Private Cloud**

A **private cloud** is a cloud environment dedicated to a single organization. It can be hosted either on the organization's own premises or managed by a third-party provider. The private cloud can be expensive due to the cost of dedicated hardware, maintenance and setup. The private cloud offers high security and is suitable for organizations handling sensitive data.

**Example**

A large bank may use a private cloud to manage sensitive customer data securely. This private cloud can be hosted within the bank's own data centers or managed by a third-party provider.

**3. Hybrid Cloud**

A **hybrid cloud** is a combination of public and private clouds. It uses the technology that allows data and applications to be shared between public and private clouds. It allows organizations to keep sensitive data in the private cloud while using the public cloud for less critical operations.

**Example**

A company can use a private cloud to store sensitive employee data and a public cloud for hosting its website.

www.ilmkidunya.com

### 4. Multi-Cloud

A **multi-cloud** is a cloud deployment model in which an organization uses the services from two or more cloud providers. The main goal of a multi-cloud strategy is to avoid dependency on a single provider. It also enhances resilience by ensuring that services can continue functioning even if one provider experiences downtime.

**Example**

A company may use Amazon Web Services (AWS) for hosting applications, Google Cloud for data analytics applications and Microsoft Azure for storage and backup. This allows the company to select the best services from each provider based on performance, features or cost.

**Q. Briefly compare different cloud deployment models.**

**Comparing Deployment Models**

Each cloud deployment model has its own advantages and disadvantages based on the needs, security requirements and budget of the organization.

**Public cloud model** is cost-effective and easy to scale that makes it ideal for businesses with limited budgets. However, it generally offers less control and security that may be a concern for sensitive data.

**Private cloud model** provides higher levels of security, privacy and control as the infrastructure is only used by one organization. However, it is more expensive to set up and maintain.

**Hybrid cloud model** combines features of public and private clouds and offers a balance of flexibility, control and cost. It allows organizations to keep sensitive data in the private cloud while using the public cloud for less critical operations.

**Multi cloud model** allows organizations to use services from multiple cloud providers. It improves availability, offers flexibility in and improves resilience to distribute workloads across platforms.

**Q. Discuss different applications of cloud computing.**

Cloud computing has changed the way individuals and organizations manage, process and store data. It is widely used in many fields such as education, healthcare, banking and information technology. The applications of cloud computing continue to grow as technology advances.

Some common and important applications of cloud computing are as follows:

### 1. Data Storage

Cloud storage allows users to save data on remote servers rather than on local devices. This makes it easier to access data from anywhere and share it with others. For example, the services like **Google Drive** and **Dropbox** allow users to store and share files online. Businesses can use cloud storage to keep backups of their data to ensure it is safe from local hardware failures or other issues.

### 2. Web Hosting and Content Delivery

Cloud computing provides the infrastructure needed to host websites and deliver content efficiently to users around the world. For example, the platforms like **Amazon Web Services (AWS)** and **Microsoft Azure** offer web hosting services for businesses to run the websites on cloud servers.

www.ilmkidunya.com

The content delivery networks such as **Cloudflare** help to deliver website content quickly by storing it on servers close to the end-users.

### 3. Machine Learning and AI in the Cloud

Cloud computing offers powerful tools to develop and run machine learning models and artificial intelligence applications. For example, **Google Cloud AI** and **AWS SageMaker** provide cloud-based platforms to build, train and deploy machine learning models easily. The data scientists and developers can create AI solutions without needing extensive local computing resources.

**Q. What are the implications of cloud computing? Discuss the factors that must be considered when planning and managing cloud services.**

### Implications of Cloud Computing

Cloud computing provides many benefits but also presents challenges such as data security, cost control, scalability and compliance. Organizations must consider these factors when planning and managing cloud services.

### 1. Data Security

Security is one of the most significant concerns in cloud computing. There are many risks for the sensitive data stored on remote servers such as unauthorized access, data breaches and accidental loss.

- **Security Challenges:** Cloud service providers use strong security systems to protect data. However, the users must also take steps to protect data. The problems such as unauthorized access, data theft and data loss can still occur if proper precautions are not taken.
- **Security Measures:** The users should protect data using encryption, strong passwords and two-factor authentication. It is also important to review security settings regularly. Most cloud providers offer built-in tools to manage and secure stored data. These steps reduce risks and keep cloud data more secure.

### 2. Scalability and Resource Management

- **Scalability:** Cloud services can automatically increase or decrease computing resources depending on real-time needs. For example, more servers can be added during peak time and reduced during off-peak times. Scalability enables businesses to handle changes in workload efficiently and cost-effectively.
- **Resource Management:** Resource management is the process of monitoring, controlling and optimizing the use of cloud resources such as storage and processing power. Effective resource management ensures that cloud services run efficiently without overuse or waste of resources.

### 3. Cost Considerations

Cloud computing is generally cost-effective because users only pay for the resources they use. However, improper usage or lack of monitoring can lead to unexpectedly high expenses. The users may pay for the unused or unnecessary services if they do not manage their usage carefully.

www.ilmkidunya.com

Effective cost management is essential to ensure that the expenses remain within budget. The users should regularly monitor cloud usage to control expenses. It is important to optimize resource allocation and choose pricing plans that match their specific needs. Many cloud providers offer budgeting and cost-monitoring tools to manage spending efficiently.

**4. Compliance and Regulatory Issues**

Compliance and regulatory issues refer to the legal and industry-specific rules that organizations must follow when using cloud services. These include data privacy laws, security standards and operational guidelines that vary by country or region. For example, the healthcare organizations must follow **HIPAA** regulations in the United States. The companies operating in Europe must comply with the **General Data Protection Regulation (GDPR)**. These rules govern how data is collected, stored and shared. Cloud providers often provide tools and features to help the users meet these legal and regulatory requirements.

**Q. How can the concept of a shared digital notebook help explain the fundamentals of blockchain technology?**

Blockchain is often compared to a digital notebook shared among a group. Everyone has a copy of the notebook and any change made is updated in all copies at the same time. This analogy helps to explain the distributed nature of blockchain.

Suppose a group of friends keeps track of debts using a shared notebook. When someone pays back money, it is recorded in all copies of the notebook at the same time. No single person controls the notebook and everyone can see the same information. Blockchain works in similar way. It records transactions and distributes them across a network of computers called nodes. This ensures transparency, consistency and trust as no one can alter a record without the others noticing.

**Q. Discuss some important features of blockchain.**

Some important features of blockchain are as follows:

**1. Transparency**

**Transparency** means that everyone in the blockchain network can see what is recorded. This makes it difficult for anyone to cheat or change information.

**2. Security**

Blockchain is highly secure because it uses cryptography. **Cryptography** is the mathematical method used to protect and lock the data in the blockchain. It keeps the data safe from unauthorized access or changes.

**3. Decentralization**

Decentralization means that no single person or central computer controls the blockchain. The blockchain is maintained by a network of computers called **nodes**. Each node stores a full copy of the blockchain. The nodes work with other nodes to validate and record transactions. This decentralized structure reduces the risk of system failure and increases network security.

www.ilmkidunya.com

**Q. Describe the core principles of blockchain technology.**

**Core Principles of Blockchain**

Blockchain technology has several principles that make it secure, transparent and trustworthy. These principles are essential for the proper functioning of blockchain network. The core principles of blockchain are as follows:

**1. Decentralization**

Decentralization means that no single person or central computer controls the blockchain. The blockchain is maintained by a network of computers called **nodes**. Each node stores a full copy of the blockchain. The nodes work with other nodes to validate and record transactions. This decentralized structure reduces the risk of system failure and increases network security.

**2. Immutability**

**Immutability** means that a block added to the blockchain cannot be altered or deleted. This ensures that all transaction history is permanent. It builds trust because it guarantees that data remains accurate and unaltered over time.

**3. Consensus Mechanisms**

**Consensus mechanisms** are the processes used to ensure that all nodes in a blockchain network agree on the validity of each transaction. All nodes must reach a common agreement before a new block is added to the blockchain. The block is rejected and not added if consensus is not reached. This process helps to protect the network from incorrect or fraudulent transactions.

**Q. Describe the key components of a blockchain system.**

**Blockchain Components**

A blockchain system consists of several key components as follows:

**1. Node**

A **node** is a computer that participates in the blockchain network. Each node maintains a copy of the entire blockchain network and helps to validate transactions and newly created blocks.

**2. Ledger**

The **ledger** is a shared digital record of all verified transactions that have occurred on the blockchain. It is continuously updated across all nodes in the network. It ensures that all participants have access to a consistent and accurate transaction history.

**3. Block**

A **block** is a collection of validated transactions that are grouped together and added to the blockchain in the order they occur. Each block contains the following key elements:

- A timestamp that indicates when the block was created.
- A unique identifier known as a **hash**. It acts as a digital fingerprint of the block.
- A reference to the previous block known as the **parent hash**.
- A list of validated transactions

www.ilmkidunya.com

### 4. Transaction

A **transaction** is a record of a specific operation or action within the blockchain. It represents the transfer of assets or information between participants in a blockchain network. For example, a transaction may involve sending cryptocurrency or sharing data between users.

### 5. Blockchain Protocol

The blockchain protocol is a set of rules and procedures that govern how the blockchain operates. It defines how transactions are validated, how blocks are added and how consensus is achieved among nodes. The protocol ensures the integrity and security of the blockchain network.

- **Integrity:** Data is accurate and has not been tampered with.
- **Consistency:** All nodes have the same, agreed-upon version of the ledger.
- **Security:** Protection against malicious attacks and unauthorized access.

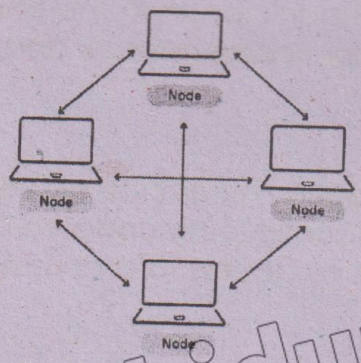
**Q. What is a peer-to-peer network? Give an example.**

**Peer-to-Peer Network**

A **Peer-to-Peer (P2P) network** is a system where the nodes communicate and share resources directly with each other without using a central server. Each node can act as both a client and a server. The client requests data and server provides data. P2P networks are decentralized that means no single authority controls the entire network. These networks are considered robust because they continue to function even if some nodes fail or go offline. This structure allows users to share resources such as files, data or processing power without depending on a central authority.

**Example**

A common example of a P2P network is a file-sharing system. In such systems, users can download files directly from the computer of another user instead of central server. It reduces the load on any single device and speeds up file transfers.



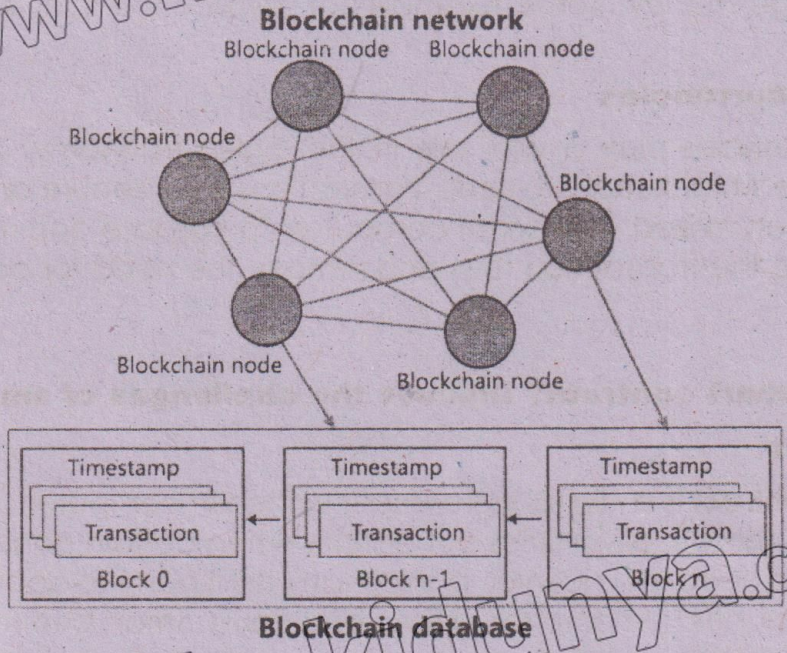

**Q. How is a peer-to-peer (P2P) network used in a blockchain system?**

**Use of Peer-to-Peer Network in Blockchain**

The nodes in blockchain systems are connected through a peer-to-peer network. This network allows all nodes to store, validate and update blockchain data equally. Each node maintains its own copy of the blockchain ledger. When a new transaction occurs, it is broadcast to all nodes in the network. These nodes then validate the transaction and add it to a new block.

www.ilmkidunya.com

Each block contains a timestamp and a set of validated transactions. These blocks are linked together in a sequence to form the blockchain. Equal participation ensures that all nodes have the same rights and responsibilities in maintaining the ledger. This decentralized structure eliminates the need for a central authority.




**Q. Discuss the most important use cases of Blockchain technology.**

**Use Cases of Blockchain Technology**

Some of the most important use of blockchain technology include the following:

**1. Cryptocurrencies**

Blockchain is the core technology behind cryptocurrencies such as Bitcoin. It enables secure and decentralized digital transactions without the need for banks.

**2. Supply Chain Management**

Blockchain is used in supply chain management to track and verify the movement of goods from origin to destination. Each step is recorded transparently on the blockchain. It helps to prevent fraud, reduce human errors and ensure authenticity of products. It leads to build greater trust between manufacturers, suppliers and customers.

**3. Healthcare**

Blockchain can provide a secure and efficient way to store and manage patient records and medical data. It ensures that sensitive health information is only accessible to authorized personnel. This improves data security, privacy and accuracy.

**4. Voting Systems**

Blockchain technology can be used to develop secure and transparent voting systems. It can ensure that votes are accurately recorded and counted to reduce the risk of election fraud. It increases public trust in the voting process.

www.ilmkidunya.com

**Q. What are cryptocurrencies? Discuss their role in digital economy.**

**Cryptocurrencies**

Cryptocurrencies are types of digital money that people can send to each other directly without using a bank. These cryptocurrencies offer a fast, secure and global way to exchange money. Some examples of cryptocurrencies include Bitcoin and Ethereum.

**Role of Cryptocurrencies**

Cryptocurrencies play a vital role in the digital economy. They use a special technology called blockchain to keep transactions safe, secure and transparent. This system uses decentralized network of computers to validate and record transactions. They also reduce the transaction fees and remove the need for banks to process the payments.

**Q. What is a smart contract? Discuss the challenges of smart contracts.**

**Smart Contract**

A **smart contract** is a digital agreement written in computer code that runs on a blockchain. It automatically carries out actions when certain conditions are met. This means there is no need for a lawyer, bank or any third party to approve or process the agreement. It reduces human error, delays and fraud. Smart contracts are commonly used on the Ethereum blockchain. It allows developers to create decentralized applications (DApps) using smart contracts. **DApps (Decentralized Applications)** are the apps that run on a blockchain and use smart contracts to perform the tasks automatically. They operate without central control and are often more secure.

**Example**

A student pays for an online course using cryptocurrency. The smart contract automatically unlocks the course as soon as the payment is confirmed. There is no need for a bank, teacher or admin to process the payment or give access. Everything happens automatically and securely.

**Challenges of Smart Contracts**

Smart contracts are powerful but they also have some challenges. The biggest issue is that they must be error-free. The Smart contracts cannot be changed easily once deployed. The legal systems in many countries are still not ready to solve problems if something goes wrong with a smart contract.

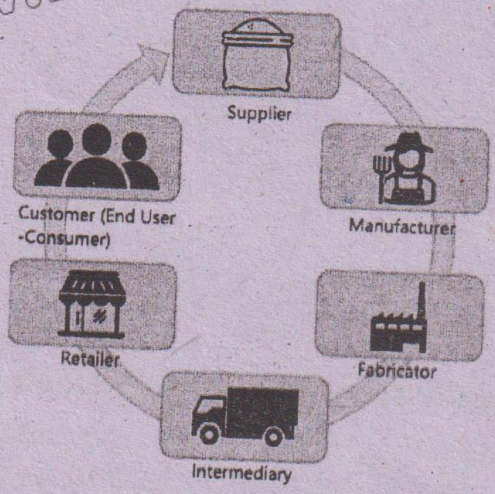
**Q. Discuss how blockchain technology is used to track the origin of products in a supply chain.**

**Tracking the Origin of Products**

Blockchain technology provides a clear and secure way to track the origin and movement of products through each stage of the supply chain. It enables companies to know exactly where a product comes from and how it reaches the customer. Every transaction is recorded on a shared digital ledger that is stored across many computers. It ensures that the journey of a product is secure, reliable and traceable.

www.ilmkidunya.com

The following figure shows the connections between various entities in the supply chain such as suppliers, manufacturers, retailers and customers etc. It illustrates how blockchain records each step between these entities. Each transaction is securely logged on the blockchain that makes it possible to track the journey of a product from its origin to the customer.




**Q. Briefly discuss the use of blockchain technology in financial services.**

**Blockchain in Financial Services**

Banks and financial companies also use blockchain to make transactions faster and safer. For example, sending money to another country usually takes a long time and can cost a lot. Blockchain makes it quicker and cheaper.

**Q. Discuss data security in blockchain. Provide a real-world analogy to explain how blockchain protects data.**

**Data Security in Blockchain**

**Data security** in blockchain ensures that information stored in a blockchain is protected from unauthorized access, change or loss. Blockchain uses advanced methods such as encryption and digital signatures for data security. Data security is important because blockchains often store sensitive information such as financial or identity data. The data can be stolen or changed if it is not protected. Blockchain protects the data by ensuring only authorized people can access or update it.

**Example: Sending a Secure Letter**

Suppose the user wants to send a letter containing important information to a friend. It is important to make sure that no one else can read or change it while it is being delivered.

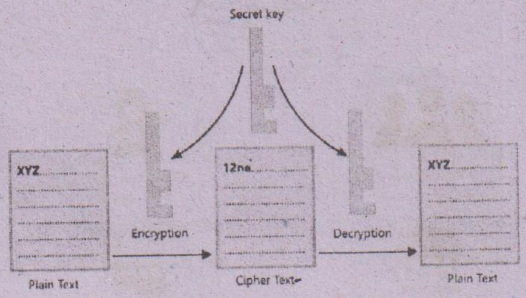
**Sealing the Letter (Encryption)**

The letter can be sealed in a special envelope that only the friend can open. The blockchain uses a similar process called encryption. **Encryption** protects data by converting it into a form that cannot be read without a secret key. Secret key is used to encrypt plain text into cipher text and decrypt it back into plain text. This keeps the information private and secure to ensure that only the right person can see or understand the data.

www.ilmkidunya.com

### Signing the Letter (Digital Signature)

The user signs the envelope using his unique signature. The friend knows the signature and can check that the letter came from his friend and has not been altered. In blockchain, a similar process is performed using a digital signature. A **digital signature** verifies that the data comes from a trusted source and has not been tampered with during transmission.




### Sending the Letter through a Trusted System (Blockchain Network)

The user sends the letter through a secure and trusted delivery system where every step is tracked. The system detects and blocks it if anyone tries to change the delivery address or tamper the letter. Similarly, a blockchain network stores all data in blocks. Any attempt to alter the data is immediately detected and rejected by the network to maintain data integrity.

### Multiple Copies of the Letter (Decentralization)

The copies of the letter can be sent through multiple trusted delivery services to ensure it is not lost. If one copy is lost, others still arrive safely. This process is called **decentralization** in blockchain where data is stored on many computers called nodes. If one node fails, the data remains safe and accessible from other nodes.

## Q. What are different future trends and innovations?

### Future Trends and Innovations

Future trends in cloud computing and blockchain are focused on improving efficiency, scalability and real-time processing. These innovations aim to transform how technology is used across industries.

### 1. Evolving Technologies in Cloud Computing

Cloud computing is becoming more powerful and flexible through continuous advancements. These technologies help cloud systems become faster, more scalable and easier to use.

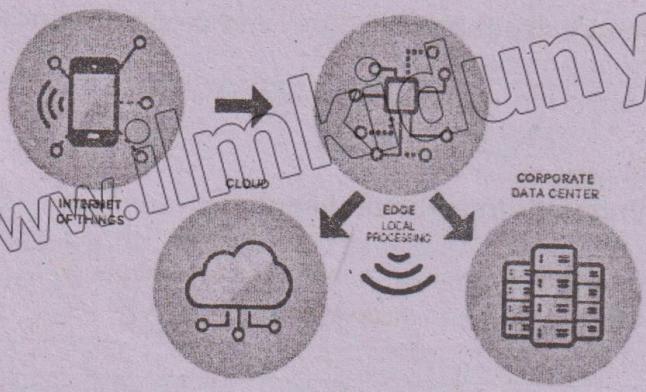
### 2. Edge Computing

**Edge computing** is a method where data is processed near the source rather than in centralized data centers. It reduces delays and enables faster decision-making. It is especially useful for systems that need very fast responses such as smart cities, health monitoring devices and industrial automation.

### Example

In autonomous vehicles, edge computing allows data from sensors and cameras to be processed directly within the car. This enables the vehicle to react quickly to changing road conditions that improves both safety and efficiency.

www.ilmkidunya.com




### 3. Serverless Architectures

**Serverless computing** allows the developers to build and run applications without managing servers. This cloud providers in this model automatically assign the required resources needed and users only pay for what they use. This makes applications more scalable and reduces complexity of infrastructure management. Serverless functions typically run in response to specific events such as a file upload or a database update.

**Example**

**Amazon Web Services (AWS) Lambda** is a serverless computing service. It allows developers to write and run code without setting up or managing any servers.

---

## Exercise Solution

### Multiple-Choice Questions (MCQs)

1. **The main benefit of edge computing:**
   a) Lower cost
   b) Reduced latency
   c) Increased complexity
   d) Enhanced security
2. **A cloud deployment model with resources shared among multiple organizations with common concerns:**
   a) Public Cloud
   b) Private Cloud
   c) Community Cloud
   d) Hybrid Cloud
3. **The advantage of using a distributed ledger in blockchain technology:**
   a) Centralized control for quick decision-making
   b) Easy alteration of transaction histories
   c) Enhanced transparency and security through decentralized verification
   d) Lower computational requirements
4. **A cloud deployment model combining public and private cloud features:**
   a) Public Cloud
   b) Hybrid Cloud
   c) Community Cloud
   d) Multi-Cloud
5. **The purpose of a distributed ledger in blockchain:**
   a) Central authority management
   b) Secure and transparent data sharing among multiple participants
   c) Fewer participants required
   d) Data visibility only to central authority
6. **A cloud service offering a platform for developing, running, and managing applications without managing infrastructure:**
   a) Infrastructure as a Service (IaaS)
   b) Platform as a Service (PaaS)
   c) Software as a Service (SaaS)
   d) Data as a Service (DaaS)
7. **The service model enabling application deployment without server management:**
   a) Infrastructure as a Service (IaaS)
   b) Platform as a Service (PaaS)
   c) Software as a Service (SaaS)
   d) Serverless Architecture

www.ilmkidunya.com

8. **The feature introduced in Blockchain 2.0 beyond cryptocurrency:**
   a) Enhanced mining techniques
   b) Decentralized applications and smart contracts
   c) Better graphics
   d) Faster internet speeds
9. **The primary advantage of serverless architectures:**
   a) Cost savings
   b) Constant server management
   c) Increased hardware needs
   d) Manual scaling

**Answers**

| | | | | | |
|---|---|---|---|---|---|
| 1. b | 2. c | 3. c | 4. b | 5. b | 6. b |
| 7. d | 8. b | 9. a | | | |

**Short Questions**

**Q.1. Analyze the role of Peer-to-Peer Networks in Blockchain. How do they function and why are they essential?**

Peer-to-peer (P2P) networks in blockchain allow nodes to store, validate and update blockchain data equally. Each node maintains its own copy of the blockchain ledger. It enhances transparency as all nodes can view the same transaction history. It also improves reliability because the system does not rely on a single central point of failure.

**Q.2. Describe the concept of immutability in blockchain. Why is it a critical feature?**

Immutability means that a block added to the blockchain cannot be altered or deleted. This ensures that all transaction history is permanent. It allows blockchain to provides reliable and unchangeable record of all transactions. It also builds trust because it guarantees that data remains accurate and unaltered over time. This makes it a critical feature for maintaining the integrity of the blockchain.

**Q.3. What is edge computing and how does it benefit data processing?**

Edge computing is a method where data is processed near the source rather than in centralized data centers. It benefits data processing by reducing delays and enabling faster decision-making. Edge computing is especially useful for systems that need very fast responses such as smart cities, health monitoring devices and industrial automation.

**Q.4. Describe the concept of serverless architectures.**

Serverless computing allows the developers to build and run applications without managing servers. This cloud providers in this model automatically assign the required resources needed and users only pay for what they use. This makes applications more scalable and reduces the complexity of infrastructure management.

**Q.5. How does edge computing improve the efficiency of autonomous vehicles?**

Edge computing improves the efficiency of autonomous vehicles by processing data within the vehicle or nearby infrastructure rather than relying on cloud servers. It reduces delay and enables real-time decision-making for tasks like obstacle detection and lane changes etc. It also ensures the vehicle operates safely even when network is weak or interrupted.

**Q.6. Differentiate between Elasticity and On-Demand access in cloud computing.**

Elasticity allows cloud systems to automatically adjust computing resources by increasing or decreasing them based on current demand. On-demand access means the user can use computing resources as needed without waiting for long setup process.

**Long Questions**

**Q.1. Define cloud deployment models and assess the differences among them.** (See chapter)

**Q.2. Classify the various types of cloud services and compare them, highlighting key distinctions.** (See chapter)

**Q.3. Discuss the advancements and benefits of edge computing in modern technology.** (See chapter)

**Q.4. Explain the concept of serverless architectures and their impact on application development.** (See chapter)

www.ilmkidunya.com

**Q.5. Describe "Cloud Deployment Models" with examples.** (See chapter)

## SHORT QUESTIONS

**Q.1. What are emerging technologies?**

Emerging technologies are new tools, systems, or methods that are being developed or have recently started to be used. These technologies can change the way we live, work and interact with the world. These technologies can be used in every field of life such as education, information technology, medical, transportation and communication etc.

**Q.2. Give five examples of emerging technologies.**

Five examples of emerging technologies include Artificial Intelligence (AI), Cloud computing, Internet of Things (IoT), blockchain and Biotechnology.

**Q.3. What is Artificial Intelligence (AI)?**

Artificial Intelligence refers to the ability of machines or software to learn and perform tasks like human beings. Voice recognition, face recognition and decision making are qualities of human intelligence that can be present in artificial intelligence.

**Q.4. What is IoT (Internet of Things)?**

The Internet of Things (IoT) refers to a system in which every day physical objects are connected to the internet. These objects use sensors and network connectivity to collect, send and receive data. IoT makes life easier, safer and more efficient. Some commonly used IoT-enabled devices include smartphones, smartwatches, home appliances, smart thermostats, smart light bulbs and cars.

**Q.5. Which devices can be connected through IoT?**

Some common devices that can be connected through IoT include smartphones, smartwatches, home appliances, smart thermostats, smart light bulbs and cars.

**Q.6. How is augmented reality (AR) different from virtual reality (VR)?**

Augmented Reality (AR) adds computer-generated elements such as images, videos or sounds to the real-world environment while Virtual Reality (VR) creates a completely virtual, computer-generated environment. AR can be experienced through devices such as smartphones or AR glasses whereas VR requires special headsets and controllers.

**Q.7. What is the purpose of 5G technology?**

5G is the fifth generation of wireless technology. It provides faster internet speeds and more reliable connections. It improves the performance of mobile phones, smart devices and real-time applications. It also supports the growth of emerging technologies such as augmented reality (AR) and virtual reality (VR) by offering the required high-speed data transfer.

**Q.8. What is quantum computing?**

Quantum computing is a type of advanced computing that uses tiny building blocks called qubits. It is faster than traditional computing.

**Q.9. How is quantum computing faster from traditional computing?**

Quantum computing uses qubit that can represent both 0 and 1 at the same time which is different from regular bit that can only represent either 0 or 1. This unique ability allows quantum computers to solve certain complex problems much faster than traditional computers.

**Q.10. What is biotechnology and how is it used?**

Biotechnology is the use of living organisms such as bacteria, plants or cells to develop new products or solve practical problems. It combines biology with technology to improve health, agriculture and the environment.

**Q.11. What is cloud computing?**

Cloud computing refers to the delivery of computing services such as data storage, software applications and processing power over the Internet. It allows users to access these services without installing them on a local device. Some examples of cloud computing platforms include Google Drive, Dropbox and Amazon Web Services (AWS).

www.ilmkidunya.com

**Q.12. Write some advantages of cloud computing.**

The advantage of cloud computing is that it offers unlimited processing and storage capacity. It provides access to applications and data anywhere in the world via the Internet. It also reduces the cost of buying computers and peripheral devices.

**Q.13. How does cloud computing differ from traditional computing?**

Cloud computing differs from traditional computing by eliminating the need to store all data and programs on a personal computer. Instead, it allows users to access files, applications, music, and pictures from any device with an internet connection. This provides greater flexibility, mobility and reduces dependence on specific hardware.

**Q.14. What is virtualization in cloud computing?**

Virtualization is a technology that enables a single physical machine to run multiple virtual machines (VMs). Each virtual machine acts like a separate computer. These virtual machines operate independently and run their own operating system and applications. This increases efficiency and resource utilization.

**Q.15. What is scalability in cloud computing?**

Scalability refers to the ability to increase computing resources such as servers or storage when demand rises. Suppose the user runs an online store. The number of buyers increase during special events such as Eid. Scalability allows the user to add more servers to handle the increased traffic. It ensures that the website runs smoothly without slowing down or crashing.

**Q.16. What is elasticity in cloud computing?**

Elasticity allows cloud systems to automatically adjust computing resources by increasing or decreasing them based on current demand. It ensures efficient use of resource use and prevents unnecessary costs.

**Q.17. What types of resources are available through cloud computing?**

Cloud computing provides storage, software, servers and processing power. These resources can be used for websites or applications. They are available as needed. The users can scale resources up or down easily.

**Q.18. Write three main types of cloud services.**

Three main types of cloud services are Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Each type offers different levels of control, flexibility, and management based on the user's needs.

**Q.19. What is Infrastructure as a Service (IaaS)?**

IaaS provides basic computing resources including virtual servers, data storage and networking hardware. It is delivered on a pay-as-you-go basis that means the users pay only for the resources they use. The users have control over operating systems, applications and storage. The cloud provider manages the underlying physical infrastructure.

**Q.20. Give some examples of IaaS providers.**

Amazon Web Services (AWS) offers users to rent virtual servers to run applications. Some other popular IaaS providers are Microsoft Azure and Google Compute Engine.

**Q.21. What is Platform as a Service (PaaS)?**

PaaS provides a cloud-based platform for developers to build, deploy and manage applications without managing the underlying hardware and software infrastructure. It is a complete development and deployment environment that includes programming languages, databases, web servers and operating systems.

**Q.22. What is Software as a Service (SaaS)?**

SaaS allows users to access software applications over the internet. These applications are hosted and managed by the cloud service provider. The users simply subscribe to the service and access the applications online. They do not need to install or manage any hardware or software on their own devices.

**Q.23. What is the difference between PaaS and SaaS?**

The difference is that PaaS provides a platform for building, testing and deploying applications while SaaS provides ready-to-use software applications to end users. PaaS is mainly for developers while SaaS is for general users and businesses.

www.ilmkidunya.com

**Q.24. Write some examples of SaaS platforms.**

Google Workspace includes widely used applications such as Gmail, Google Docs and Google Drive. Some other common SaaS platforms include Microsoft Office 365 and Salesforce.

**Q.25. What is the role of Salesforce in cloud computing?**

Salesforce is one of the most widely used Software as a Service (SaaS) platforms. It allows businesses to manage customer information, monitor sales activities, and automate marketing. Salesforce is used by over 150,000 companies worldwide to improve operational efficiency and customer satisfaction.

**Q.26. What is a cloud deployment model?**

Cloud deployment models define how cloud services are made available, delivered and managed for users or organizations. Each model offers a different level of control, security and flexibility. The selection of a deployment model depends on the specific needs and goals of the organization or individual users.

**Q.27. What are the key considerations for choosing a cloud deployment model?**

The key considerations for choosing a cloud deployment model include security, cost, scalability and flexibility. Organizations must evaluate their specific needs and goals before making a decision.

**Q.28. List four deployment models of cloud computing.**

The four deployment models of cloud computing are Public Cloud, Private Cloud, Hybrid Cloud, and Multi-Cloud. Each model offers a different level of control, security and flexibility.

**Q.29. How does a public cloud differ from a private cloud?**

Public cloud is shared by multiple users and managed by a third-party provider. It is cost-effective but offers lower control and security. A private cloud is used by a single organization and offers more privacy and control. However, it is more expensive and harder to manage.

**Q.30. How does the multi-cloud model benefit organizations?**

A multi-cloud benefits organizations by not relying on a single provider. It enhances resilience by ensuring that services can continue functioning even if one provider experiences downtime.

**Q.31. What is cloud data storage and how does it benefit users?**

Cloud storage allows users to save data on remote servers rather than on local devices. This makes it easier to access data from anywhere and share it with others. Businesses can use cloud storage to keep backups of their data to ensure it is safe from local hardware failures or other issues.

**Q.32. What is web hosting in cloud computing?**

Web hosting in cloud computing is the service of storing and running websites on virtual servers that draw resources from a network of physical servers.

**Q.33. How do content delivery networks (CDNs) improve website performance?**

CDNs store copies of website content on multiple servers across the globe. When a user accesses a site, content is delivered from the closest server. This reduces loading time and improves user experience.

**Q.34. How does cloud computing support machine learning and AI?**

Cloud computing offers powerful tools to develop and run machine learning models and artificial intelligence applications. For example, Google Cloud AI and AWS SageMaker provide cloud-based platforms to build, train and deploy machine learning models easily.

**Q.35. List some common security challenges in the cloud.**

Some common security challenges in the cloud include unauthorized access, data theft and data loss etc. These issues can happen if the users are not careful.

**Q.36. How can users enhance security in cloud computing?**

The users should protect data using encryption, strong passwords and two-factor authentication. It is also important to review security settings regularly. Most cloud providers offer built-in tools to manage and secure stored data. These steps reduce risks and keep cloud data more secure.

www.linkedunya.com

**Q.37. Why is resource management essential in cloud computing?**

Resource management is essential in cloud computing as it controls and optimizes the use of cloud resources such as storage and processing power. Effective resource management ensures that cloud services run efficiently without overuse or waste of resources.

**Q.38. How can users control costs in cloud computing?**

The users can control costs in cloud computing by regularly monitoring cloud usage. It is important to optimize resource allocation and choose pricing plans that match their specific needs. Many cloud providers offer budgeting and cost-monitoring tools to manage spending efficiently.

**Q.39. What is meant by compliance in cloud computing?**

Compliance refers to the legal and industry-specific rules that organizations must follow when using cloud services. These include data privacy laws, security standards and operational guidelines that vary by country or region.

**Q.40. What is blockchain technology?**

Blockchain is a digital ledger or database of transactions that is shared and maintained by network users. The information is not stored at a single central location. It is stored across a network of computers around the world. Blockchain is the fundamental technology behind digital currencies such as Bitcoin.

**Q.41. List key features of blockchain.**

The key features of blockchain are transparency, security and decentralization. It provides a secure and transparent way for people to share and keep track of information.

**Q.42. Name core principles of blockchain technology.**

The core principles of blockchain technology are decentralization, immutability, and consensus mechanisms. These principles ensure the functionality and security of the blockchain.

**Q.43. What is meant by a distributed ledger in blockchain?**

A distributed ledger means the data is stored across multiple computers (nodes) instead of one central server. Every participant has an identical copy of the ledger. This reduces the risk of data loss or manipulation. It also increases transparency and trust.

**Q.44. How does transparency work in blockchain?**

Transparency means that everyone in the blockchain network can see what is recorded. This makes it difficult for anyone to cheat or change information.

**Q.45. What is cryptography in blockchain?**

Cryptography is the mathematical method used to protect and lock the data in the blockchain. It keeps the data safe from unauthorized access or changes.

**Q.46. What does decentralization mean in blockchain?**

Decentralization means that no single person or central computer controls the blockchain. The blockchain is maintained by a network of computers called nodes. Each node stores a full copy of the blockchain. The nodes work with other nodes to validate and record transactions. This decentralized structure reduces the risk of system failure and increases network security.

**Q.47. What is the role of consensus mechanisms in blockchain?**

Consensus mechanisms are the processes used to ensure that all nodes in a blockchain network agree on the validity of each transaction. All nodes must reach a common agreement before a new block is added to blockchain. The block is rejected and not added if consensus is not reached. This process helps to protect the network from incorrect or fraudulent transactions.

**Q.48. What is a node in a blockchain?**

A node is a computer that participates in blockchain network. Each node maintains a copy of entire blockchain network and helps to validate transactions and newly created blocks.

**Q.49. What is a block in blockchain technology?**

A block is a collection of validated transactions that are grouped together and added to the blockchain in the order they occur.

www.uniquebooks.com

**Q.50. What key elements are contained in a block of blockchain technology?**

Each block contains a timestamp that indicates when the block was created. It contains a unique identifier known as a hash that acts as a digital fingerprint of the block. It also contains a reference to the previous block known as the parent hash and a list of validated transactions.

**Q.51. What is a transaction in blockchain?**

A transaction is a record of a specific operation or action within the blockchain. It represents the transfer of assets or information between participants in a blockchain network. For example, a transaction may involve sending cryptocurrency or sharing data between users.

**Q.52. What is the blockchain protocol?**

The blockchain protocol is a set of rules and procedures that govern how the blockchain operates. It defines how transactions are validated, how blocks are added and how consensus is achieved among nodes. The protocol ensures the integrity and security of the blockchain network.

**Q.53. What is a peer-to-peer (P2P) network?**

A Peer-to-Peer (P2P) network is a system where the nodes communicate and share resources directly with each other without using a central server. Each node can act as both a client and a server. The client requests data and server provides data.

**Q.54. What role does blockchain play in cryptocurrency?**

Blockchain is the core technology behind cryptocurrencies such as Bitcoin. It enables secure and decentralized digital transactions without the need for banks.

**Q.55. How does blockchain help in supply chain management?**

Blockchain is used in supply chain management to track and verify the movement of goods from origin to destination. Each step is recorded transparently on the blockchain. It helps to prevent fraud, reduce human errors and ensure authenticity of products. It leads to greater trust between manufacturers, suppliers and customers.

**Q.56. How is blockchain used in healthcare?**

Blockchain can provide a secure and efficient way to store and manage patient records and medical data. It ensures that sensitive health information is only accessible to authorized personnel. This improves data security, privacy and accuracy.

**Q.57. What is the advantage of using blockchain in voting systems?**

Blockchain technology can be used to develop secure and transparent voting systems. It can ensure that votes are accurately recorded and counted to reduce the risk of election fraud. It increases public trust in the voting process.

**Q.58. What are cryptocurrencies?**

Cryptocurrencies are types of digital money that people can send to each other directly without using a bank. These cryptocurrencies offer a fast, secure and global way to exchange money. Some examples of cryptocurrencies include Bitcoin and Ethereum.

**Q.59. What role do cryptocurrencies play in the digital economy?**

Cryptocurrencies play a vital role in the digital economy. They use a special technology called blockchain to keep transactions safe, secure and transparent. This system uses decentralized network of computers to validate and record transactions. They also help to reduce the transaction fees and also removes the need for banks to process the payments.

**Q.60. What is a smart contract?**

A smart contract is a digital agreement written in computer code that runs on a blockchain. It automatically carries out actions when certain conditions are met. This means there is no need for a lawyer, bank or any third party to approve or process the agreement. It reduces human error, delays and fraud.

**Q.61. How do smart contracts work?**

Smart contracts are commonly used on the Ethereum blockchain. These contracts are used to perform the tasks automatically. They operate without central control and are often more secure. For example, a smart contract can release payment automatically when goods are delivered.

www.ilmkidunya.com

**Q.62. What is a decentralized application (DApp)?**

DApps (Decentralized Applications) are the apps that run on a blockchain and use smart contracts to perform the tasks automatically. They operate without central control and are often more secure.

**Q.63. What are some challenges of smart contracts?**

Smart contracts are powerful but they also have some challenges. The biggest issue is that they must be error-free. The smart contract cannot be changed easily once deployed. The legal systems in many countries are still not ready to solve problems if something goes wrong with a smart contract.

**Q.64. How does blockchain help in tracking products?**

Blockchain provides a clear and secure way to track origin and movement of products through each stage of supply chain. Every transaction is recorded on a shared digital ledger that is stored across many computers. It ensures that journey of a product is secure, reliable and traceable.

**Q.65. How can blockchain be used for digital art?**

Artists can use blockchain to prove ownership of digital art. Each artwork has a unique digital signature stored on the blockchain. This ensures it is the original work and prevents copying or fraud.

**Q.66. How is blockchain used in financial services?**

Banks and financial companies also use blockchain to make transactions faster and safer. For example, sending money to another country usually takes a long time and can cost a lot. Blockchain makes it quicker and cheaper.

**Q.67. What does data security mean in blockchain?**

Data security in blockchain ensures that information stored in a blockchain is protected from unauthorized access, change or loss. Data security is important because blockchains often store sensitive information such as financial or identity data.

**Q.68. How is a digital signature used in blockchain?**

A digital signature is a unique code attached to data that proves who sent it. In blockchain, it ensures that the data came from a trusted source and was not changed during transmission.

**Q.69. What happens if someone tries to tamper with a blockchain transaction?**

A blockchain network stores all data in blocks. If someone tries to tamper with a block, it will not match the records on other nodes. It will be rejected by the network.

**Q.70. How do companies like Amazon and Microsoft contribute to blockchain networks?**

The companies like Amazon and Microsoft provide powerful computers and cloud services to support blockchain networks. This helps to run blockchain systems more efficiently.

**Q.71. What is AWS Lambda?**

Amazon Web Services (AWS) Lambda is a serverless computing service. It allows developers to write and run code without setting up or managing any servers.

---

## Multiple Choice Questions

1. **The primary purpose of _____ is to examine data to find useful information, patterns or trends.**
   a. Data analytics
   b. Data encryption
   c. Data warehousing
   d. Data modeling
2. **Which of the following is NOT considered an emerging technology?**
   a. Artificial Intelligence
   b. Virtual Reality
   c. Cloud Computing
   d. CRT televisions
3. **Which technology enables machines to think, learn and make decisions like humans?**
   a. Cloud Computing
   b. Artificial Intelligence
   c. Blockchain
   d. Internet of Things

www.ilmkidunya.com

4. **Which emerging technology is used in self-driving cars?**
   a. Blockchain
   b. Artificial Intelligence
   c. Virtual Reality
   d. Quantum computing
5. **Which of the following is an example of Artificial Intelligence (AI) in everyday life?**
   a. Basic calculator
   b. Smart assistants like Siri
   c. Cryptocurrencies
   d. Virtual reality headsets
6. **AI stands for:**
   a. Automatic Interface
   b. Applied Internet
   c. Artificial Intelligence
   d. Advanced Integration
7. **Which technology allows users to store and access data and applications over the internet?**
   a. Cloud computing
   b. Quantum computing
   c. Blockchain
   d. Virtual Reality
8. **Which of the following is NOT a cloud computing service?**
   a. Google Drive
   b. Dropbox
   c. Amazon Web Services (AWS)
   d. Siri
9. **Which technology serves as the foundation for cryptocurrencies like Bitcoin?**
   a. Cloud computing
   b. Blockchain
   c. Internet of Things
   d. Artificial Intelligence
10. **Which technology allows everyday objects such as refrigerators and thermostats to connect to the internet and share data?**
    a. Cloud computing
    b. Blockchain
    c. Internet of Things (IoT)
    d. Artificial Intelligence
11. **Which of the following is NOT typically considered an IoT device?**
    a. Smart cars
    b. Smart refrigerator
    c. Mobile Charger
    d. Smart thermostat
12. **IoT stands for:**
    a. Internet of Topics
    b. Internet of Things
    c. Internet of Technology
    d. Integrated Online Transactions
13. **AR stands for:**
    a. Advanced Rendering
    b. Artificial Reality
    c. Augmented Reality
    d. Applied Robotics
14. **VR stands for:**
    a. Verified Reality
    b. Virtual Rendering
    c. Virtual Reality
    d. Visual Range
15. **Which technology adds digital content to the real-world environment?**
    a. Virtual Reality
    b. Augmented Reality
    c. Artificial Intelligence
    d. Mixed Reality
16. **Which technology creates a fully immersive, computer-generated environment that feels real to the user?**
    a. Augmented Reality
    b. Virtual Reality
    c. Mixed Reality
    d. Computer-Aided Design
17. **Which of the following is a common device used for Augmented Reality (AR) experiences?**
    a. Smartphone
    b. Keyboard
    c. Printer
    d. Scanner
18. **Which device is commonly used to experience Virtual Reality?**
    a. Keyboard
    b. VR Headset
    c. Printer
    d. Webcam
19. **5G is considered the next generation of:**
    a. Electricity
    b. Wireless technology
    c. Cable networks
    d. Bluetooth accessories
20. **What is one major benefit of 5G technology?**
    a. Lower bandwidth capacity
    b. Faster internet speed
    c. Higher latency
    d. Unlimited free data plans

www.ilmkidunya.com

21. **Which technology enables computers to solve certain complex problems much faster than classical computers?**
    a. Cloud computing b. Quantum computing
    c. Machine Learning d. Digital photography
22. **What is the basic unit of information in quantum computing?**
    a. Bit b. Byte c. Qubits d. Pixel
23. **Which organism is commonly used in biotechnology to produce medicines and other products?**
    a. Bacteria b. Rocks c. Yeast d. Fungi
24. **Biotechnology can improve:**
    a. Internet speed b. Crop quality
    c. Television displays d. Phone battery life
25. **Which technology allows one physical computer to run multiple independent virtual machines (VMs)?**
    a. Cloud Computing b. Virtualization
    c. Data Mining d. Machine Learning
26. **Which cloud computing feature allows systems to automatically adjust the resources based on workload demands**
    a. Compliance b. Encryption
    c. Scalability d. Backup
27. **Which of the following is NOT a main type of cloud service?**
    a. Infrastructure as a Service (IaaS) b. Software as a Service (SaaS)
    c. PaaS (Platform as a Service) d. Desktop as a Service (DaaS)
28. **Which cloud service provides virtual servers, storage, and networking?**
    a. PaaS b. SaaS c. IaaS d. CRM
29. **Which of the following is an example of an IaaS provider?**
    a. Google Workspace b. Amazon Web Services (AWS)
    c. Salesforce d. Heroku
30. **_____ provides a complete development environment for building and deploying cloud applications.**
    a. IaaS b. SaaS c. PaaS d. CRM
31. **PaaS (Platform as a Service) is primarily used by:**
    a. General users b. Software developers
    c. Hardware engineers d. Marketing teams
32. **Which of the following is an example of PaaS?**
    a. Google App Engine b. Microsoft Office 365
    c. Salesforce d. Dropbox
33. **Heroku is best classified as which type of cloud service?**
    a. SaaS b. IaaS c. PaaS d. None
34. **Which cloud service delivers ready-to-use software applications over the internet?**
    a. IaaS b. PaaS c. SaaS d. None
35. **Who typically uses Software as a Service (SaaS)?**
    a. Network administrators b. End-users
    c. Programmers d. System analyst
36. **Which of the following is an example of Software as a Service (SaaS)?**
    a. Google Workspace b. Amazon Web Services (AWS)
    c. Google App Engine d. Microsoft Azure
37. **Google Workspace (formerly G Suite) is a SaaS platform that includes:**
    a. Gmail b. Google Docs
    c. Google Drive d. All
38. **Salesforce is an example of:**
    a. IaaS b. PaaS c. SaaS d. DaaS
39. **Salesforce is best known for providing:**
    a. Financial accounting b. Network security
    c. Operating systems d. Customer Relationship Management

www.ilmkidunya.com

40. **How many companies approximately use Salesforce?**
a. Over 5,000 b. Over 50,000
c. Over 150,000 d. Over 1 million

41. **Which of the following is NOT a cloud deployment model?**
a. Public Cloud b. Private Cloud
c. Ground Cloud d. Hybrid Cloud

42. **Which deployment model is shared among multiple organizations?**
a. Private Cloud b. Hybrid Cloud
c. Public Cloud d. Multi-Cloud

43. **Which cloud deployment model provides the highest level of control and security for sensitive data?**
a. Private Cloud b. Hybrid Cloud
c. Public Cloud d. Multi-Cloud

44. **Which cloud deployment model enables data and applications to be shared between public and private clouds?**
a. Distributed cloud b. Community cloud
c. Hybrid cloud d. Edge cloud

45. **Which cloud deployment model is most cost-effective?**
a. Public cloud b. Private cloud
c. Hybrid cloud d. Multi-cloud

46. **Which cloud deployment model provides greater flexibility and control?**
a. Public cloud b. Private cloud
c. Hybrid cloud d. Multi-cloud

47. **Which of the following is NOT a cloud storage service?**
a. Google Drive b. Dropbox
c. Windows File Explorer d. iCloud

48. **Which of the following provides cloud infrastructure services for web hosting?**
a. Slack b. Amazon Web Services (AWS)
c. Microsoft Office d. Salesforce

49. **Which technology stores and delivers website content from servers that are geographically closer to users to improve speed and performance?**
a. Domain Name System (DNS) b. Web Browser
c. Content Delivery Network (CDN) d. Email Server

50. **Which company is a leading provider of Content Delivery Network (CDN) services?**
a. Salesforce b. Cloudflare c. Oracle d. DropBox

51. **Which cloud service is specifically designed for building, training, and deploying machine learning models?**
a. Google Calendar b. AWS SageMaker
c. Dropbox d. Microsoft Excel

52. **A _____ refers to unauthorized access to sensitive data.**
a. Data breach b. Data backup
c. Data mining d. Data compression

53. **In cloud computing, _____ refers to adhering to legal and regulatory requirements.**
a. Compliance b. Bandwidth
c. Scalability d. Virtualization

54. **Which technology uses a decentralized, distributed ledger to enable secure and transparent transactions?**
a. Blockchain b. Virtual Private Network
c. DBMS d. Cloud computing

55. **Which of the following is NOT a characteristic of blockchain technology?**
a. Decentralization b. Transparency
c. Centralized control d. Security

56. **What is the primary mechanism that secures blockchain data and prevents tampering?**
a. Cryptography b. Password
c. Firewall d. Compression

www.ilmkidunya.com

57. **What is a key feature that ensures everyone can see the same data in a blockchain?**
a. Privacy b. Transparency
c. Compression d. Hosting

58. **Which principle ensures blockchain data cannot be changed?**
a. Decentralization b. Immutability
c. Scalability d. Virtualization

59. **How does a blockchain network ensure that all nodes agree on the validity of a transaction?**
a. Centralized approval b. Consensus mechanism
c. Email confirmation d. Automatic encryption

60. **A computer that participates in a blockchain network is called:**
a. Server b. Node c. Block d. Ledger

61. **A shared digital record of all transactions in a blockchain system is called:**
a. Block b. Node c. Ledger d. Protocol

62. **How are validated transactions organized in a blockchain before being added to the permanent record?**
a. Block b. Chains c. Tokens d. Networks

63. **In a blockchain, each block has a unique identifier called a:**
a. Key b. Lock c. Tokens d. Hash

64. **Which element in a block links it to the previous block?**
a. IP address b. Parent hash
c. Timestamp d. Transaction ID

65. **Which of the following is not a component of a typical block?**
a. Hash b. Parent hash
c. List of transactions d. Email ID

66. **Which component of blockchain represents the transfer of assets or information between participants?**
a. Block b. Transaction c. Ledger d. Node

67. **Which component of blockchain defines the rules for transaction validation?**
a. Transaction ID b. Hash function
c. Protocol d. Ledger

68. **A _____ in a blockchain records the exact time when the block was created.**
a. Parent hash b. Hash c. Timestamp d. Ledger

69. **Which of the following is a popular cryptocurrency that uses blockchain?**
a. PayPal b. Bitcoin c. Google Pay d. Visa

70. **Smart contracts run on which technology?**
a. Internet of Things (IoT) b. Blockchain
c. Operating systems d. Cloud storage

71. **Which platform is known for enabling developers to create decentralized applications (DApps) using smart contracts?**
a. Bitcoin b. Ethereum c. Litecoin d. Ripple

72. **Which process in blockchain protects data by converting it into an unreadable format for unauthorized users?**
a. Hashing b. Compression
c. Encryption d. Digitization

73. **Which feature in blockchain is used to prove the sender's identity and ensure that the data has not been altered?**
a. Encryption b. Decryption
c. Digital signature d. Timestamp

74. **Which term refers to processing data closer to the source instead of a central server?**
a. Cloud routing b. Edge computing
c. Hybrid hosting d. Ripple

75. **Which of the following is NOT a benefit of edge computing?**
a. Reduced latency b. Improved efficiency
c. Centralized data control d. Real-time response

www.ilmkidunya.com

**76. What is the term used to describe delay in data transfer or response time in edge computing?**

a. Bandwidth
b. Latency
c. Throughput
d. Encryption

**77. Which of the following allows developers to build and deploy applications without managing infrastructure?**

a. Serverless computing
b. Virtual machines
c. On-premise servers
d. Edge computing

**78. In a serverless model, who manages the servers?**

a. Developers
b. End-users
c. Cloud providers
d. Hardware vendors

**79. Which of the following is a serverless computing service?**

a. AWS Lambda
b. AWS EC2
c. Azure Virtual Machines
d. Google Kubernetes Engine

**Answers**

| | | | | | |
|---|---|---|---|---|---|
| 1. a | 2. d | 3. b | 4. b | 5. b | 6. c |
| 7. a | 8. d | 9. b | 10. c | 11. c | 12. b |
| 13. c | 14. c | 15. b | 16. b | 17. a | 18. b |
| 19. b | 20. b | 21. b | 22. c | 23. a | 24. b |
| 25. b | 26. c | 27. d | 28. c | 29. b | 30. c |
| 31. b | 32. a | 33. c | 34. c | 35. b | 36. a |
| 37. d | 38. c | 39. d | 40. c | 41. c | 42. c |
| 43. a | 44. c | 45. a | 46. c | 47. c | 48. b |
| 49. c | 50. b | 51. b | 52. a | 53. a | 54. a |
| 55. c | 56. a | 57. b | 58. b | 59. b | 60. b |
| 61. c | 62. a | 63. d | 64. b | 65. d | 66. b |
| 67. c | 68. c | 69. b | 70. b | 71. b | 72. c |
| 73. c | 74. b | 75. c | 76. b | 77. a | 78. c |
| 79. a | | | | | |

www.ilmkidunya.com
www.ilmkidunya.com
www.ilmkidunya.com